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ABSTRACT

This paper explains how a World Wide Web site was designed to assist preservice teacher education students in reflecting upon their learning and to assist a teacher educator to reflect upon his teaching in university classes. The students reflected on their learning experiences in university classes using a three-phase reflective framework: (1) analysis; (2) synthesis; and (3) theorizing. In the last phase, the students developed a metaphor to represent an optimum classroom learning environment. The Web site was designed using a FileMaker Pro database with a template for each influence on learning (personal, teaching, peer, and situational) to assist students in managing, sharing, and theorizing about their reflections. Students claimed that the Web site supported their reflections and the metaphor helped them to conceptualize the dynamics of classroom relationships, which also provided ongoing data for teacher reflection. (Contains 17 references.) (Author/SM)

Integrating a Reflective Framework within Web-based Templates for Student and Teacher Self-Study

by

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Abstract: This paper explains how a WWW site was designed to assist preservice teacher education students to reflect upon their learning and to assist a teacher educator to reflect upon his teaching in university classes. The students reflected on their learning experiences in university classes using a three-phase reflective framework: (i) analysis; (ii) synthesis; and (iii) theorizing. In this last phase the students developed a metaphor to represent an optimum classroom learning environment. The web site was designed using a FileMaker Pro database with a template for each influence on learning—personal, teaching, peer and situational—to assist students in managing, sharing and theorizing about their reflections. Students claimed that the web site supported their reflections and the metaphor helped them to conceptualize the dynamics of classroom relationships which also provided ongoing data for teacher reflection.

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Introduction

The notion of being reflective means rethinking experiences, particularly ones which are problematic, to make clearer sense of them and to gain insights for subsequent experiences (Dewey, 1933; Schön, 1983; 1987). It is now common practice in preservice teachers education programs to encourage students to use reflective journals to rethink and analyze their experiences in university subjects (Loughran, 1995; McRobbie, 1994; Wilson, Hine, Dobbins, Bransgrove, & Elterman, 1995). This includes reflecting upon educational readings, class discussions, personal thoughts or school experiences. However, the content of the reflection is often about *what* students understand, what they don't understand and to specify areas which require further readings or explanations. Rarely are preservice teachers asked to reflect upon the processes of their learning—*how* they learn, how they are being taught, or how they interact with other students.

During their training, preservice teachers are exposed to a wide range of teaching strategies and content as well as interacting with a variety of students. This exposure to a variety of learning situations provides a wonderful opportunity for preservice students to study the processes of their learning. When trainee teachers gain these insights, they can deduce implications for their own pedagogy based on personal experiences. Although this idea was raised over 30 years ago, it is a rare practice in teacher education programs:

The student in the process of becoming a teacher is not made acutely aware of how he is learning, that is, to utilize himself as a source of understanding of the nature of the learning process. . . . one of the major reasons so many teachers are dissatisfied with themselves in their work is that their training did not illuminate the nature of *their* learning process and how this relates to and affects the learning process of their pupils. (Sarason, Davidson, & Burton, 1962, p. 118)

What is an increasing trend in teacher education classes, is for teacher educators to model reflective practice and study their own teaching as a source for research. This form of teacher research called "Self-study" has been evolving over

the last 7 years and is a form of teacher research (Lytle & Cochran-Smith, 1999) or what Richardson (1994) called "practical inquiry." There are two essential components of self-study. One involves individual reflection which is "a personal process of thinking, refining, reframing and developing actions" (Loughran & Northfield, 1998, p. 15). This is often documented in autobiographies, personal diaries or by simply talking to yourself (Richards, 1996).

But self-study is more than just navel gazing in the mirror. As an evolving methodology, self-study "begins to push boundaries of what counts as data, how to collect data, how to report data, and what counts as research" (Hamilton & Pinnegar, 1998, p. 240). The second essential component of self study—making reflections public—is central to this process. Exposing for scrutiny personal interpretations on teaching engages an individual in a dialogic process of justifying beliefs to knowledge similar to what Fenstermacher (1994) called "warranting claims". Checking personal reflections with others confirms or disconfirms interpretations resulting in a deeper understanding of personal practice which is the heart of self-study. Often this involves reflective conversations with colleagues within an educational institution or across institutions at conferences or in the review process of publishing articles.

Various technologies are now being developed to support both personal reflection and data sharing to enhance the methodology of self-study. Tools for these purposes include e-mail, World Wide Web sites, video and CD-ROM. When preservice students are asked to reflect upon complex interactions such as how they are learning, technologies such as the World Wide Web can be a useful tool to support students in documenting, analysing and sharing insights (Bennett, 1998). This self-study by preservice teachers can also provide data for the self-study of the teacher educator. Student reflection then becomes a dialogic process with teacher reflection creating conversations about real teaching and learning. The purpose of this paper is to explain how a World Wide Web site was designed with templates to encourage preservice teachers to study how they learn in university classes and how this also informed teacher self-study. Use of the www site for personal reflection will be explained first followed by use of the web site to support data sharing which are the two features of self-study as a form of teacher research.

1. Using WWW Templates for Personal Reflection in University Classes

Over the last four years, a reflective framework has been developed to guide preservice teachers in studying how they learn in university classes (Hoban, 1997, 1998, In Press). This framework encourages each preservice teacher to be "a researcher in the practice context" (Schön, 1983, p. 68) with the context being their experiences as learners in their university classes. There are three phases in the framework which encourage students to analyze their experiences, synthesize key factors which influence learning and to develop a metaphor to represent an optimal learning environment. The first phase occurs for the duration of the subject and the second and third phases are completed by students towards the end of the subject, although they can be completed concurrently by students.

In 1999, a WWW site was designed with a FileMaker Pro database as a tool to help preservice students use the reflective framework. The site was designed with the intention of minimising the cognitive load on students when reflecting by using a screen design which "promotes understanding by allowing the reader to focus on new information rather than devoting time and energy to variations for format" (El-Tigi & Maribe Branch, 1997, p. 25). In addition, the web site assisted students in organizing and theorizing about their reflections to deduce a metaphor to represent an

optimal learning environment. In spring semester 1999, 30 trainee teachers used the WWW site in a preservice science methods subject which lasted for 13 week in an elementary teacher training program. The students had a three hour class each week. Two hours were spent with the students doing hands-on science experiments and a third hour was spent reflecting upon how they learned in the class using the web site. The three phases of the reflective framework are now described as well as how it informed student and teacher self-study.

Self-study by Preservice Teachers

Phase 1 Analysis. After each university class students logged onto the WWW site and reflected upon their class experiences to identify the personal, social (teaching and peer) and situational factors which influenced his/her learning. There was a template for each category which is consistent with a constructivist perspective that views learning as an individual process of knowledge construction that is supported by social interactions with the outside world (Duffy & Cunningham, 1993). Each template was labelled according to one of the following four categories:

1. *personal* factors attributed to each student, such as prior knowledge, feelings, self esteem, motivation and personal learning strategies;
2. *teaching* factors attributed to the instructor/tutor, such as class organisation, teaching strategies, class organisation goals, and rapport;•
3. *peer* factors attributed to other students such as how they encourage each other, share ideas and cooperate in tasks; and
4. *situational* factors attributed to the task, setting and environment.

After each class, the students identified factors which enhanced or inhibited their learning and documented these processes or strategies in the templates on the WWW site. Table 1 contains examples of Elizabeth's weekly reflections according to what she wrote in the four templates of the web site in week 2 of the subject. It should be noted that Elizabeth noted a positive factor with a "+" and a negative factors with a "-" and highlighted key words using upper case:

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Table 1. Examples of a Preservice Teacher's Reflections in Week 2

Influencing Factor	Student Reflections
<i>Personal Factors</i>	- I am not confident with teaching science in front of an audience therefore I feel this elective will be very rewarding as I will gain KNOWLEDGE, CONFIDENCE and UNDERSTANDING of how to teach science to a young audience. + I work better in an environment where I am comfortable and feel free to exchange ideas and questions without the worry/fear that others will criticize me. This style of teaching suits the way I learn. + As this was the first real science lesson I had no idea of what to expect from this elective so I was INTERESTED and WILLING to get involved with the debates and answer any questions thrown at me.
<i>Teaching Factors</i>	+ Today's teaching strategies were very suited to my learning and understanding of science. I enjoy a RELAXED environment where I feel free to contribute to the class discussions. + It was amazing how pre-knowledge that I have gained over time was used in this lesson. I didn't realize simple experiments can make things clear. - Initially, I didn't feel it was necessary to write a reflection of the lesson on the internet. I prefer to share and discuss how I feel in some cases I feel it easier to talk about problems or ideas rather than writing it down. - I'd prefer writing on the white board to be set out more clearly and more information for each point when an idea is raised. + It was interesting that there is no right way to go about teaching a particular subject, everyone goes about learning differently. I enjoyed the many different styles that were discussed (the frameworks). + the instructor seemed to deliver the information clearly and effectively providing relevant FEEDBACK in order for us (the students) to improve.
<i>Peer Factors</i>	- Initially, everyone in the class was a little daunted at what to expect from this science lesson. + From this lesson I feel confident with raising issues and asking questions. Everyone in the class was willing to accept everyone's ideas openly and ask for any queries. + The class members continually gave positive ENCOURAGEMENT to those students who didn't understand the work covered. Everyone tried to help everyone understand what the lesson was about (TEAMWORK). + I enjoyed working in small groups to achieve each activity everyone had their own idea on what they thought was right. + Already I have met new friends from this lesson and together we have worked together to achieve the work set out.
<i>Situational Factors</i>	+ This class is not large therefore where the instructor was teaching or standing was always close by. There were no heads in the way, there was enough material to go round, the labs which are well lit and everyone had a great attitude to work (I suppose this was because this was the first week). + It was great having food and coffee provided for us which also seemed to break up the lesson. + As the materials were well set out it was easy to get straight into the hands-on-activities and get started. + Everyone in the class seemed to get on well with everyone (CO-OPERATION) therefore it was easy to reap the rewards of each activity.

The students continued to document their experiences on the web site over a period of 8 weeks.

Phase 2 Synthesis. Towards the end of the subject, students collated factors documented in their weekly reflections according to the same four categories identified in phase 1. After the students completed their collations, they used an iterative process of "constant comparative analysis" (Glasser & Strauss, 1967, p.vii) to compare, combine and synthesize factors resulting in the identification of several key factors for each of the four categories. The WWW site helped students to synthesize their reflections because it was designed to collate similar categories for all the weeks so that students could scan them to identify the most influential factors. For example, the data base within the web site linked the templates from week to week enabling each student to see the personal factors across all the weeks on one screen. This aggregation of the reflections assisted the students to identify the key factors within each category and these were summarized in a table called a "Learning Profile". Collectively, the key factors highlighted in their Learning

Profile represent a student's identification of factors which would establish an optimal learning environment for them in a university class. It should be noted that an optimal learning environment would only be possible if all of the enhancing factors (or nearly all) were present. The following documentation represents Elizabeth's Learning Profile which is the synthesis of key factors for each category for the duration of the subject:

Personal

- knowledge, confidence and understanding
- interested and willing to get involved
- preparation is necessary in order to benefit from the lesson
- motivation
- sense of achievement
- prior knowledge: you need to do the readings
- "what you put in is what your get out!"

Teaching

- creating a relaxed environment
- positive feedback/reinforcement for us (the students) to improve
- information given to the students is clear and concise
- providing relevant examples to explain concepts
- classroom management
- teacher involvement

Peer

- positive encouragement
- working as a team (teamwork).
- group dynamics
- group motivation when needed. eg. 'We can do anything, come on girls!!!'

Situational

- all class members working together (co-operation)
- the relaxed atmosphere created by the teacher and students
- materials safe and accessible (all materials are available when needed)
- the preparation of each activity e.g. layout and materials needed
- timing of the lesson e.g. activities

Phase 3 Theorising. Each preservice student considered the key enhancing factors identified in phase 2 and theorized about the relationships between them to devise a metaphor (Lakoff & Johnson, 1980) that represents an optimal learning environment for a university class. Although the students did not use the web site for designing their metaphor, it was labeled with key factors identified in their Learning Profile from phase 2. Nonetheless, the process of theorising was assisted by having the reflective data presented systematically and collectively in the templates. This thinking is consistent with (Strauss & Corbin, 1994) interpretation of a theory as "*plausible relationships proposed among concepts and sets of concepts*" (p. 278, italics in original). Alternatively, students may conceptualise the metaphor earlier from their reflections in the subject and then use the factors from their profile to label the diagram.

The student, Elizabeth, whose reflections have been shown in phases 1 and 2 theorized to develop a metaphor of "learning to snow ski" to represent her optimal learning environment as shown in Figure 1. This metaphor was sketched and labeled with personal factors such as "prior knowledge, confidence, perseverance and motivation", teaching factors such as "guidance, feedback, clear and concise instruction" and peer factors such as "encouragement, teamwork and group motivation".

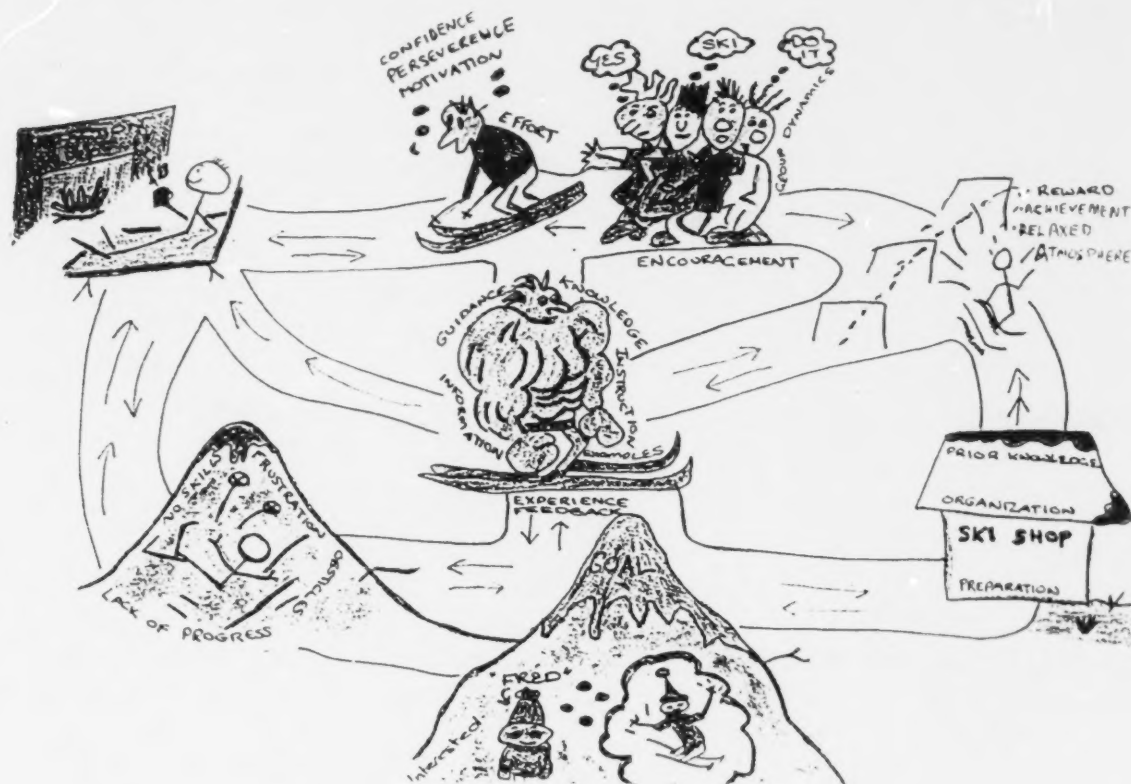


Figure 1. Elizabeth's Teaching-Learning Metaphor of "Learning to Ski"

She explained how her metaphor of a learning to ski represented a relationship between teaching and learning and deduced implications for her classroom teaching:

There are many steps involved before turning into a proficient skier similar to the fact that it takes time and practice before you are a capable student in any area of learning. It is important that the student sets a goal on what they want to achieve, however, there are decisions to be made on the plan of attack. The ski shop is an integral part in the learning process as preparation, organization and understanding are necessary to commence learning. Comparing this to a classroom situation is being prepared with homework, equipment and prior knowledge so that you are not disadvantaged to the rest of the class. The most important factor is the instructor/teacher who provides correct information, positive reinforcement/feedback, guidance and instruction. In most classroom settings the teacher is the main focus for students in preparing, organizing and implementing various lessons.

Generating a metaphor is like producing a mental model of teaching and learning and other students in the class generated a range of metaphors such as playing an instrument in an orchestra, learning to be an acrobat in a circus, playing in a one-day cricket match, going on a mountain hike, being in a rocket blasting off into space, playing in a fun park and playing a game of baseball. In addition, students are expected to use these insights into an optimal learning environment to draw implications for their future role as teachers.

Self-study by the Teacher Educator

As each of the preservice students are analysing and documenting teaching strategies each week, the teacher educator can scan the comments by different students as the basis for reflection on their practice. This provides insights into what strategies are "working" and "not working" for different students. For example Table 2 shows reflections on my teaching by two students for the same experiences in week 2 of the subject. Any positive comments have a "+" sign and any negative comments have a "-" sign. Comparing the two sets of data from the students provided me with several insights about my teaching in the second week of the subject:

- student A liked the structure of the three hour class as there were lots of "hands-on, practical activities"
- student A provided some constructive criticism on my teaching as she believed that the students should be advised to do some background reading on the selected science topic so that they have some background knowledge on the topic.
- student A liked having time to reflect on teaching and learning immediately after the class.
- student B thought that I spoke to all the students except that I did not take into account that some of the students were in second year and some were in third year. This created some tension within the group as the second year students did not have the background knowledge in planning that the third year students did. This was something that I did not take into account at the beginning of the subject but was informed about this via the student reflections on my teaching. As a consequence of this I had to be more aware of the different background of students in the class.

Table 2. Comparison of Two Students' Reflections on my Teaching from Week 2

Student A Reflections on my "Teaching" in Week 2	Student B Reflections on my "Teaching" in week 2
+ The way that the content and sequence of the 3 hour tutorial is structured is great. We (the learners) know that we will have approximately an hour of LECTURE, QUESTIONING and DISCUSSION of last weeks and this weeks work. This is followed by an EXAMPLE (sample unit) of the framework we are analysing and HANDS-ON, PRACTICAL activities. Finally, we are given REFLECTION time where we analyse our own learning. + The reflection time allows every learner in the class to give FEEDBACK to the teacher, so that he may FOLLOW UP any problems. + After the practical activities, it is important that we were able to give our own EXPLANATIONS (right or wrong) of each phenomena, combined with the teacher's own knowledge.	+ Spoke well to us all. - there were stages in which Gary perhaps forgot that not all of us are at the same knowledge level (year) when talking of planning units of work. I could understand what was being discussed, but I felt that I had nothing to contribute as I do not have the background knowledge of the 3rd years. That is, they have planned units of work, whereas so far in 2nd year, we've only really just come to terms with lesson plans. - + A good point that I got out of this was that a Unit of work focuses on an "objective" and lessons focus on "outcomes". That's always something that has messed me up in C&P. + The fact that the lessons were based on something that could be pre-read in the Curriculum Resource

- It would have been useful to advise the class to do some BACKGROUND READING on boats, floating and submarines so that we felt more confident with our own answers. Practicals are good for discovery but we, as teachers, should be more knowledgeable about the information we are passing on to young learners.

- I think that even if a member of the class has already contributed some information to the discussion, this should not dis-allow them from speaking up a second time. Every student in the classroom is valuable and all their relevant ideas and comments should be acknowledged - this is how we learn. The first thing that a teacher needs to do, even in university classes, is to make us feel VALUED. This directly influences our attitude to and enjoyment of the class.

Centre, was good, because I didn't feel like Blind Freddy going into class without a clue.

+ I love the use of diagrams as I learn things better through visuals, pictures, graphs, maps etc. The mind-map type thing that Gary constructed on the board to explain the simple structure of this journal was brilliant.

2. Using WWW Templates for Data Sharing in University Classes

In addition to filling in the four templates (personal, teaching, peer and situational factors) for personal reflection, the students also completed a weekly summary of their learning experience (anonymously) which was accessible to all students. For example Table 3 shows how three different student summarised their learning experiences in week 3 and it was not the same experience for all three students.

Table 3. Comparison of Three Students' Public Summaries for Week 6

Student A	Student B	Student C
Um, yeah it was good. Best bit was when Ben got creative and changed the experiment a little. Was exactly what I would have done. Could have been better if we all got the chance to experiment with blowing things up - you know - who could make the loudest explosion/ the lid go the furthest/ the most lava - that would have been the bestest!! Biggest negative of all time - I AM SO SICK OF THE BLOODY ROCKS!!! A topic can be over-killed and I am afraid to say that the interest in the rocks, DIED YEARS AGO!!!!!!!!!!!!!!	4mat learning style is one when broken down into different sections is easier to understand. The activities flowed in conjunction with the style however the continual experiments on rocks was BORING. Bringing a student to explain her experience with writing science unit was very helpful as it showed that what we do learn and do at uni can be used in the real world. Unfortunately thought the lecture was then quite RUSHED and UNINTERSETING. Time management was a problem here and it caused the activity time to SUFFER.	I've got more important things of my mind rather than Science (Department of Education and Training interviews), so I wasn't very focused. But overall I enjoyed the lesson(even though it was rocks again!). It was great to here from another student that her unit worked successfully. The volcano and explosion experiments were fun. I would use these in the classroom.

It can be seen from the table that two of the students did not like the topic of "Rocks" whereas one of the students quite enjoyed it (student C). Also it is evident from the student C comments that the student had other things on his/her mind that distracted them from participating in the activities. The interviews were their employment interviews to be eligible for teaching for the state government. It is evident that students' prior experiences and also the other events happening in their lives affects the way students participate in class. From monitoring the students' public summaries I was able to get insights into my own teaching which are summarised in Table 4.

Table 4. Insights for my Self-study from Student Use of the Reflective Framework

Insights from Student Reflections	Implications for my own teaching
• students do not experience the same learning in any tutorial • students like a clear purpose for the lesson • students have different levels of prior knowledge about topics • students like to have a connection made between lectures and tutorial experiences • students like me to know them as a person • learning does not happen in an instant and can be in stages • use humor to build a relationship with the students in a class • students like to explore their own ideas • I cannot assume how students are thinking in my classes • students like me to "practice what I preach" • students like a summary at the end of a class session	• try to interact with each student to monitor their learning • begin a lecture or tutorial with an advanced organizer in the form of points to be covered or a concept map • try different strategies to ascertain students' prior knowledge at the beginning of lessons • ask students at the beginning of each tutorial about the main points from the lecture and what was confusing. • take time to know each student personally and find out their interests • try to interact with students as much as possible and revisit ideas in different ways • tell anecdotes to illustrate points about teaching and try to relate to students' experiences • encourage students to try out their ideas and learn from mistakes • tap into students' ideas by listening to their feedback and be prepared to modify my teaching • model different ways of teaching and justify why I teach the way I do • conclude each class with a revision of "what did I learn"

Discussion and Conclusion

In any one year, teacher education students attend over 300 hours of formal class time at university and are exposed to a wide range of teaching and learning experiences across different subjects. Yet little opportunity is provided for students to reflect upon these authentic experiences to analyze how they learn in different types of learning environments. In particular, trainee teachers often do not get the opportunity for self-study of their own experiences as students in class to gain a first hand understanding of the relationship between teaching and learning. This is a valuable insight for trainee teachers as designing an optimal learning environment, which is the main outcome of the reflective framework, takes into account the type of teaching *and* the type of learning *and* the type of social interaction with peers. Developing such an awareness of classroom dynamics can support students in participating in reflective conversations about teaching and learning which is a useful skill for their future role as teachers.

Furthermore, it is important that trainee teachers are not simply passive recipients of formal theory at university, but engage in theorising about their own experiences. This means systematically using a framework to reflect on experiences by documenting, analysing and seeking patterns within the data for generating personal theories. This means that preservice students can deduce implications for their own pedagogy based on the analysis of their own experiences of learning. Although students previously used the reflective framework with pen and paper (Hoban, 1997,

1998), this is the first time that students have documented their reflections on a World Wide Web site. Previously, students had to write their reflections each week in a journal and then scan manually across many pages to synthesise the key factors for each category. Also the students had to seek patterns within the data and deduce their metaphor to represent an optimal learning environment. Doing this manually was time consuming and conceptually difficult for some students.

Using the WWW site has enabled the students to manage and theorize about their reflections more easily which has reduced their cognitive load in using the framework. In an end of subject evaluation, some of the students made comments about using the web for their reflections:

The idea of using the web was good, it was convenient for everyone and everything was in front of you in the one place which made it easier to collate etc. I would prefer to use the web but have the option of doing it in my own time.

I preferred to use the web because at the end it was easier to bring everything together. I also found the reflections were more to the point and there wasn't as much rambling on. The only negative was the inconvenience of getting onto the net whenever we needed to reflect and also when the web page was down.

It was better using the web. It was a great way to group the information into the different factors and it was easier to see a clear pattern of learning.

Two issues, however, became evident when preservice teachers used the web site for the reflective framework. First, initial use of the framework was conceptually difficult for preservice students as they had not reflected upon different learning influences before and were unsure about what to look for and how to do it. For this reason, several reflective journals produced by students in previous subjects were shown at the beginning of the subject as examples of how to analyze their learning experiences. Furthermore, this needed to be revisited several times in the first few weeks with discussions about what the students were documenting. Also, towards the end of the course several students commented that this was the first course which gave them a specific framework to guide them in reflecting on their class experiences. Previously they had undertaken reflective journals in other subjects, but were not provided with a framework and students stated that in many cases they just wrote about "what the lecturer wanted to hear". It appears from the students' data that the web site made the reflective framework easier to use because it focused students in their reflections and helped them to manage the data for phases 2 and 3 of the framework.

A second issue regards the ethical issues when asking preservice students to critique themselves as learners, my teaching and to make this public on a web site. When preservice teachers study their own experiences as learners in university classes, it involves them analyzing real life relationships between teaching and learning. This necessitates teacher educators exposing their practice to critique from their own students. However, some teacher educators may be uncomfortable when making themselves vulnerable to criticism from their own students. But this practice models to preservice students the fundamental conception that teaching is by nature problematic, and the importance of conducting self-study on your own teaching practice. Some students, also, may not be comfortable when asked to analyze the teaching that they are exposed to in teacher education for fear of some form of retribution. It is important that students have the right not to participate in these forms of investigation if they are uncomfortable in doing this. Hence a level of trust has to be generated between teachers and students if they are to be open about researching the relationship between teaching and learning. Also, being honest about the quality of teaching and learning should be a

mutually beneficial experience. Students are learning about "how they learn" and teachers are learning about what instructional strategies work for particular students.

Encouraging preservice teachers to conduct research on their learning also provides teacher educators with data to reflect upon and to change their own practice. This has personally made teaching much more enjoyable because I am learning about what works and does not work for different students. Also, I know that my teaching over the last few years has improved because I have been listening to my students and have incorporated many of their suggestions into my teaching. Certainly, the WWW site made it easier to mark the students' journals as all the data were more accessible on the web site rather than screening large hand written journals. Also, it was a valuable insight for me to understand how different students responded in different ways to the same learning experience. In some weeks, the same science activities were praised by some students and criticized by others. This highlights the problematic nature of teaching and it would be valuable for the preservice students to become more aware that people experience learning in different ways. Over the years students have been using the reflective framework I have become comfortable in seeking constructive criticism from students as I am always learning from the process and I know that there is no such thing as a perfect lessons. Although students could access a summary of each student's weekly reflections on the web, they could not access the Learning Profiles or metaphors produced by other students. Perhaps the web site needs to be modified to enable sharing of the students' metaphors of teaching and learning to encourage conversations about how students have represented their learning experiences and understand that there are different perspectives on classroom dynamics.

Note

The web site discussed in this paper is available at <http://www.edonline.uow.edu.au/edus224>

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